Appendix A -- Elevators

GUIDE SPECIFICATION

The following Guide Specification is intended to be typed verbatim into the contract specification. An asterisk beside an item in the following indicates an item that is variable for each project. Where [ ] appear indicates requirements which are optional depending upon the type of elevator being provided. The handling of such items will be decided by consultation between the Project Manager and The Consultant. The Project Manager is expected to modify other portions as necessary to accurately reflect conditions of the project.

SECTION 142XX

[TRACTION, HYDRAULIC] [PASSENGER, FREIGHT] ELEVATORS

PART 1 - GENERAL

1.1 SCOPE: Contractor shall provide all services and materials to furnish and install an [electric, hydraulic] [passenger, freight elevator] [passenger elevator with freight capability] described by the Contract Documents. *[EN1]

1.1.1 General Conditions, Amendments to the General Conditions, Special Conditions, Instruction to Bidders, Division 1 and all addenda of these specifications are part of the Elevator Specifications.

1.1.2 Applicable Documents:

a. Americans with Disabilities Act (ADA), and the equivalent Washington state codes, whichever are more stringent

b. ANSI/ASME A17.1, Safety Codes for Elevators and Escalators as adopted by the State of Washington (also referred to herein as the Elevator Safety Code)

c. ASTM A167, Steel, Sheet Stainless

*NOTE: Numbers in brackets are listed at the end of the document as End Notes; e.g., [EN1].

d. ASTM A366, Steel, Sheet, Carbon, Cold Rolled, Commercial Quality

e. AWS D1.1, Structural Welding Code - Steel

f. NFPA 70, National Electric Code

1.1.3 Permits and Codes:

1.1.3.1 All equipment and installation work shall comply with requirements of the Elevator Safety Code, and other applicable codes of the State of Washington, County and City. Requirements of Appendix F of the Elevator Safety Code shall apply, and references to the Elevator Safety Code include Appendix F.

1.1.3.2 Give necessary notices, obtain licenses and permits, and pay fees and other costs, including making arrangements for all inspections and tests required by regulating agencies, in accordance with the General Conditions as amended, the Supplemental Conditions, and Division 1 of this specification.

1.1.3.3 File necessary plans, prepare documents, and obtain necessary approval of governmental departments having jurisdiction and required certificates of inspection for work, in accordance with the General Conditions as amended, the Supplemental Conditions, and Division 1 of this Specification, and deliver same to the Project Manager before requesting acceptance and final payment for work.

1.1.3.4 Contractor is not relieved from furnishing and installing work shown or specified which may be beyond requirements of ordinances, laws, regulations and codes.

1.2 CONSTRUCTION DRAWINGS: [If provided] Drawings are partly schematic in nature and do not attempt to show exact details. The Contractor shall carefully check space requirements to ensure that equipment being provided can be installed in the spaces allotted. No extra will be allowed for differences between actual measurements and scaled measurements or stationing.

[Alternate for Renovation] Drawings are partly schematic in nature. The Drawings show the best known location of existing equipment, but do not attempt to show exact details. The Contractor shall verify exact distances between points shown on the Drawings by actual measurements at the site. No extra will be allowed for differences between actual measurements and scaled measurements or stationing.

1.3 CUTTING AND PATCHING: Openings required in the exterior of the existing structure shall be done by drilling or cutting. Contractor shall provide all pipe sleeves, anchor plates, hanger supports, inserts, and bolts required for his work. [Applicable to renovation only]

1.4 DEMOLITION: The Contractor shall remove existing elevator and ancillary equipment. All equipment to be disposed of shall be removed from the site. [Applicable to renovation only]

1.5 STANDARD PRODUCTS: Unless otherwise indicated, the equipment to be furnished under these Specifications shall be the standard product of manufacturer's regularly engaged in the production of such equipment. Apparatus, equipment and systems furnished must be similar and equal thereto with respect to quality, functional performance, capacity and efficiency. Where the actual equipment furnished requires certain changes in pipe location, controls, electrical equipment and foundations, the Contractor shall coordinate such changes and submit them for approval.

1.6 SUBMITTALS:

1.6.1 Shop Drawings: Submit shop drawings for approval. They shall contain enough detailed information to determine that the equipment conforms to the requirements of this Specification and not less than the following information:

a. Shop drawings and catalog cuts for all contractor furnished material and equipment, including but not limited to doors, frames, car enclosure, car frame, controls, motors, guide rails, and brackets. Motor data must include temperature rise ratings in a form that can readily be measured in the field after installation.

b. Location of machinery and controls in machine rooms, layout of the hoistway in plan and elevation and all other layout information and clearance dimensions required by the Elevator Safety Code. The elevator equipment is

to be arranged in a neat and workman-like manner so that all valves, fittings, etc., are readily accessible.

c. [Traction Elevators] Arrangement and connection details of machine beams, deflector sheaves, and rails. Provide calculations and drawings for the City of Seattle, DCLU.

d. [Traction Elevators] Arrangement and connection details of pit equipment including buffers, compensating devices (if any), and pit ladder.

[Hydraulic Elevators] Coordination information including rail, buffer and jack beam reactions, and including data as specified in Rule 300.7 and Rule 301.2 of the Elevator Safety Code. [EN2] Detail of pit ladder. Specification for hydraulic oil.

e. Complete information on motor, electrical services, controls, and all other coordination information.

1.6.2 Wiring Diagrams: Complete wiring and single line diagrams showing the electrical connections, functions, and sequence of operation of all apparatus connected with the elevators, both in the machine room and in the hoistway, shall be furnished in triplicate. One set shall be mounted on 1/8-inch masonite, covered with 5-mil mylar with all edges secured with 2-inch vinyl tape, and mounted in the elevator machine room. The other two sets shall be delivered to the Owner.

1.6.3 Operations and Maintenance Manuals: Furnish an operation and maintenance manual covering the stipulated mechanical systems and equipment. The manual shall comply with all requirements indicated in the Project Closeout section of the specifications. Furnish one complete draft manual for Owner review prior to the time that system or equipment tests are performed.

The manual shall be complete in all respects for all equipment, controls, accessories and appurtenances stipulated. Include as a minimum the following:

a. Drawing or diagram showing equipment location.

b. Wiring and control diagrams with data to explain detailed operation and control of each component.

c. Step-by-step procedure for start-up, operation and shutdown.

d. Preventative maintenance schedule.

e. Lubrication schedule including type, grade, temperature, range and frequency.

f. Safety precautions, including diagrams and illustrations as needed for clarity.

g. Test procedures.

h. Parts lists, with manufacturers' names and catalog numbers. Lists shall be complete for the materials installed.

i. Serial number of each major piece of equipment.

j. Service organizations and sources of spare parts with names, addresses, and telephone numbers.

1.7 MATERIAL AND EQUIPMENT:

1.7.1 General: Material and equipment shall be new, of the best quality used for the purposes in good commercial practice, the best of their respective kinds, and as specified. Equipment shall be a standard product of reputable manufacturers. Where two or more units of the same class of equipment are required, those units shall be products of a single manufacturer. Furnish equipment complete with all parts necessary for proper operation.

Material and equipment shall be cleaned, free of corrosion, and selected to provide quiet operation.

1.7.2 Type capacity, size and rating of all equipment shall be as indicated on the Drawings, and/or herein specified.

1.7.3 Delivery and Storage: Material and equipment shall be suitably protected against corrosion, dirt, mechanical damage, weather and chemical damage before and during installation as recommended by the manufacturer and as approved by the Project Manager. Replace defective and damaged equipment and materials.

1.8 ELEVATOR - ELECTRICAL:

1.8.1 Provide electrical components of the elevator equipment and systems, including motors, motor starters, controllers, control instruments, switches, conduit, wire, and relays under this Division as specified herein and as necessary for complete and operable systems. Furnish interconnecting wiring for components of equipment as an integral part of the equipment. Interconnecting conduit and wiring connecting such assemblies shall conform to Division 16.

1.8.2 Electrical equipment and wiring shall conform to applicable paragraphs of Electrical Specifications and National Electrical Code.

1.8.3 For equipment with electrical components, provide UL label on each component for which published standards exist.

1.9 PAINTING: All exposed metal work furnished in these specifications, except as otherwise specified, and shall be properly painted after installation.

1.10 MAINTENANCE: The Contractor shall furnish maintenance service of the equipment for a period of twelve months after completion and final acceptance of the elevator. This service shall include regular systematic examinations of the installation by competent and trained employees of this Contractor; and shall include all necessary adjustments, lubrication, cleaning, supplies and parts to keep this equipment in operation, except such parts made necessary by misuse, accidents or negligence not caused by this Contractor. Contractor shall furnish written reports of each service call, whether routine or emergency, describing services performed. Basic service work shall be performed during regular working hours of regular working days. Emergency callback service shall be available on a 24-hour, 7-day basis.

1.11 SPARE PARTS: Provide spare parts required for maintenance of the elevator, including a complete set of fuses and contacts for all control equipment. The spare parts shall be placed in a cabinet, approximately 24 inches by 42 inches, provided by the Contractor, with doors equipped with a lock and two keys. The cabinet shall be

mounted in the machinery room as directed. The minimum spare parts shall be in place at project closeout are as follows:

a. One door operator motor.

b. One of each type of door operator circuit board for each three cars or fraction.

c. One set of car door hanger sheaves for each car.

d. One set of hoistway doors hanger sheaves for each five hoistway doors or fraction.

e. One set of door pickup rollers.

f. One complete door interlocks for each five hoistway doors or fraction.

g. One car gate switch per five cars or fraction.

h. Cables and circuit boards for door protective devices, one of each type.

i. Spare printed circuit board of each type in the controller and power supply, one set per five cars or fraction.

j. Three spare lamps of each size and type per car.

k. One set of each type of car guide rollers per five cars or fraction.

l. Two hoistway limit switches.

m. One terminal landing button assembly for each two assemblies installed.

n. One intermediate landing button assembly for each five assemblies or fraction installed.

o. One set of each type of counterweight guide rollers per five counterweights or fraction.

The following shall apply to hydraulic elevators only:

p. One replacement valve assembly for each type.

q. One complete set of pump and jack seals and gaskets.

PART 2 - PRODUCTS

2.1 GENERAL: The completed elevator installation shall conform to the Elevator Safety Code except as specifically otherwise indicated or specified. The installation, including equipment, material, workmanship, design, and tests shall be in accordance with the standards, rules and Specifications referenced. All material and equipment shall be new. Electrical materials shall meet and bear evidence of meeting the requirements of Underwriter's Laboratories or Factory Mutual Systems. The equipment shall be the product of a manufacturer regularly engaged in the manufacture and installation of this type of equipment. Working parts shall be accessible for inspection, servicing and repair. Adequate means shall be provided for the lubrication of all wearing parts that require lubrication.

2.1.1 DESCRIPTION AND PERFORMANCE: Installation will be in accordance with the following details and consist of:

	Quantity and Type	[ ] New Electric [Traction, Hydraulic] Elevator(s)
	Load (Capacity)	[ ] Pounds [EN3]
	Car Speed	[ ] Feet Per Minute
	Leveling	+/- 3/8-inch with any load
Operation	[Passenger or Dual-Purpose Elevators]	Selective Collective Automatic as normal mode, Car-Switch Automatic Floor-Stop mode or function al equivalent selectable by switch. [Freight Elevators] Car Switch Automatic Floor-Stop mode or functional equivalent.
	Performance, Floor-to-Floor	[ ] seconds for [ ] feet rise [EN4]
	Control	Solid State Microprocessor
	Power Supply	Primary Power to be [208, 480] volts, 3 phase, 60 hertz [EN5] Secondary Power Supply (to Traction Motors) to be Solid State
	Rise	[ ] feet
	Number of Stops	[ ]
	Number of Openings	[ ] at front of hoistway [ ] at rear
	Lighting Supply	120 volts, 1 phase, 60 hertz
	Clear Car Inside	Not less than [ ] square feet clear floor area [EN6]
	Type of Doors for Car and Hoistway Entrances	[Single speed, Two speed], [center opening, side opening] [EN7]
	Hoistway Entrance and Car Opening Size	[ ] wide X [ ] high

2.2 GENERAL MATERIALS:

2.2.1 Where stainless steel is specified, it shall be corrosion resisting steel, Type 304 with 150-grit finish on exposed surfaces. Stainless steel shall have the grain of belting in the direction of the longest dimension. All Surfaces shall be smooth and without waves.

2.2.2 Where cold-rolled steel is specified, it shall be low carbon steel rolled to stretcher level standard flatness, commercial quality, Class 1, matte finish, complying with ASTM A 366.

2.2.3 Tamper-proof screws shall be used throughout for all face plates.

2.2.4 All light globes shall be 5,000-hour long-life.

2.2.5 All elevator keys shall be installed to match the City standards, Elevator Products Company #2, as manufactured by Chicago Lock Company, for fireman's control switch key, and Elevator Products Co. #1 for all other keys. Provide three keys of each type per elevator.

THE FOLLOWING IS AN ALTERNATE SECTION 2.3 FOR TRACTION ELEVATORS: [EN8]

2.3 ELEVATOR MACHINERY:

2.3.1 MACHINE: A [geared, gearless] traction machine, designed and manufactured to meet or exceed the requirements of the specified duty, shall be furnished. It shall include driving motor, direct current electro-mechanical brake, [steel worm, bronze gear,] and traction sheave, all mounted on a base or bedplate.

[The worm shall be high grade steel and the worm gear shall be phosphor bronze of best quality. The end thrust of worm shaft shall be taken by high grade self-aligning ball bearings, in both directions.] The traction sheave shall be of heavy alloy iron, accurately turned and grooved for the hoist ropes. The drive sheave shall have dustproof bearings with suitable means for ample lubrication [and adjustable supporting shaft for proper alignment of the worm and gear. Soundproofing shall be provided for the geared machine, designed to minimize the transmission of noise and vibration to the building structure.] Safety guards on exposed rotating equipment and cable guards on new and existing equipment shall be provided.

2.3.2 MOTOR: The [direct current, alternating current] motor shall be especially designed for elevator service. It shall have torque and speed capability ample for the specified duty when operated with the solid-state power supply and control system furnished.

2.3.3 SHEAVES: Deflecting sheaves shall be of heavy alloy iron, accurately grooved to fit ropes, of suitable size according to conditions, and fitted with heavy steel shaft.

2.3.4 BEAMS: The hoist machine and sheaves shall be supported by structural beams furnished and set in place by the Contractor.

2.3.5 GOVERNOR: The car overspeed controls and safety shall be operated by a centrifugal speed governor located at the top of the hoistway in the machine room.

2.3.6 BUFFERS: [Oil buffers, spring buffers] shall be installed in the pit as a means for stopping the car and counter- weight at the bottom limits of travel.

2.3.7 GUIDE RAILS: Steel guide rails that meet the requirements of the Elevator Safety Code, including the guidelines of Appendix F, shall be provided for each car and counterweight.

2.3.8 ROLLER GUIDES: Polyurethane roller guides shall be provided for each car and counterweight. Car rollers shall have a minimum diameter of six inches.

2.3.9 COUNTERWEIGHT: A 40% counterweight with steel frame and filler weights restrained as required by the Elevator Safety Code shall be furnished.

2.3.10 COUNTERWEIGHT GUARD: A metal counterweight guard shall be furnished and installed at the bottom of the hoistway.

2.3.11 ROPES: The hoist ropes shall be elevator rope as required by the Elevator Safety Code. Hoist rope fastenings shall be mechanical type (other than tapered socket secured with Babbit metal or thermosetting resin) acceptable under Paragraph 212.9a(2) of the Elevator Safety Code. Governor ropes shall be steel.

THE FOLLOWING IS AN ALTERNATE SECTION 2.3 FOR HYDRAULIC ELEVATORS:

2.3 ELEVATOR MACHINERY: Each elevator shall have a positive displacement hydraulic pump driven by an electric motor and operating a hydraulic cylinder with direct plunger. The machine and all its components shall meet the requirements of the Elevator Safety Code.

2.3.1 POWER UNIT: Each elevator shall include a Power Unit consisting of the motor, pump, drive assembly, oil control unit, oil reservoir, and oil drip pan, all mounted on a structural steel base and supports. Each power unit shall have the capability of delivering oil pressure and volume to lift the assembled elevator with rated load at rated speed. Volume of each oil reservoir shall be sufficient to lift its elevator through the rise specified, plus normal overtravel. Each power unit shall have a muffler in the discharge oil line near the pump and an enclosure of steel panels lined with sound-absorbing material. Maximum sound generation of 60 dbA within the range of 20 Hz to 20 KHz, measured within the machine room.

2.3.2 HYDRAULIC PUMP: The pump shall be a submerged self-contained power unit or a discrete pump-motor set mounted outside the oil reservoir. The pump shall be designed and manufactured for oil-hydraulic elevator service. It shall provide steady discharge with minimum pulsations, and its output shall not vary more than 10% between no-load and full-load conditions of the elevator car.

2.3.3 PUMP MOTOR: The pump motor shall be designed for oil-hydraulic elevator service, of standard manufacture, and of duty rating to provide the service specified herein.

2.3.4 DRIVE ASSEMBLY: Drive assembly shall be either direct coupling or multiple V-belts and sheaves. The number and size of belts and sheaves shall be sufficient to assure continued safe operation with a single belt failure.

2.3.5 OIL CONTROL UNIT: The oil control unit shall include the necessary valves all built into a single housing; welded manifolds with separate valves for each function will not be accepted. All adjustments shall be accessible and shall be made without removing the assembly from the oil line.

a. Relief valve shall be externally adjustable and shall be capable of bypassing the total oil flow without increasing back pressure more than 50% above working pressure.

b. Up start and stop valve shall be externally adjustable, and designed to bypass oil flow during start and stop of the motor pump assembly. Valve shall close slowly, insuring smooth up starts and stops.

c. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.

d. Lowering valve and leveling valve shall be externally adjustable for drop-away speed, lowering speed, leveling speed and stopping speed to insure smooth down starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is travelling when slowdown is initiated.

2.3.6 HYDRAULIC JACK: A hydraulic jack assembly that meets the requirements of the Elevator Safety Code shall be mounted under the car platform.

a. Cylinder shall be formed from seamless or drawn-on- mandrel steel tube, protected on the exterior with triple fiberglass wrapping sealed with epoxy resin. The cylinder may be provided in sections, provided they are factory assembled, inspected and approved for alignment, and marked for proper reassembly at the site. Length of each cylinder shall be sufficient to accommodate the matching plungers. Diameter of each cylinder shall be sufficient for sleeving at some future time.

b. Plunger shall be polished seamless steel tubing or pipe. Length of each plunger shall be sufficient to lift its car through the rise specified, plus normal overtravel. Plunger shall be provided in sections not exceeding 16 feet per section, joined with internal threaded couplings. It shall be factory polished while assembled and marked for proper reassembly at the project site.

2.3.7 PIPE AND FITTINGS: Provide pipe and fittings of the size, type and weight recommended by the manufacturer. Connections shall be welded and/or bolted-flange only. Provide two manual gate or ball valves in line for each elevator, one adjacent to pump and one adjacent to the jack. Underground piping shall be covered for corrosion resistance in the same manner as specified for the jack cylinder. Underground piping shall be installed in an outer containment of plastic (including fiberglass) designed to prevent ground contamination with leaking hydraulic fluid.

2.3.8 BUFFERS: Spring buffers shall be installed in the pit as a means for stopping the car at the bottom limits of travel.

2.3.9 GUIDE RAILS: Steel guide rails that meet the requirements of the Elevator Safety Code, including the guidelines of Appendix F of ANSI A17.1, shall be provided for the car.

2.3.10 LOW OIL INDICATOR: Provide indicator light on controller to indicate that reservoir is low on oil.

2.3.11 HYDRAULIC OIL: Provide hydraulic fluid that meets the requirements of the elevator manufacturer with minimum flammability.

2.4 ELEVATOR CAR:

2.4.1 CAR FRAME, PLATFORM, AND SAFETY: A car frame and platform fabricated from steel shall be provided. [Traction and roped hydraulic machines only] A safety plank with [Type A, Type B, Type C] car safeties shall be provided.

2.4.2 SLING ISOLATION: [Traction machines] Each car shall include a means to isolate the complete car enclosure from the sounds and vibrations transmitted from the machine room through the hoist ropes. The preferred method is spring isolation of the

complete car sling and enclosure assembly from the hoist rope terminations at the car sling. Acceptable alternates include:

a. A rubber mounted hitch plate.

b. A platform mounted on rubber pads.

2.4.3 CAR ENCLOSURE: The car enclosure shall be steel and shall comply with the Elevator Safety Code. Exterior of car enclosure shall receive a sound deadening material coating.

2.4.3.1 CAR FRONT: Return panels with integral entrance columns of 14 gauge satin finish stainless steel shall extend from finished floor to underside of the fascia. Return panel(s) shall be arranged for the mounting of applied fixtures. The fascia shall be stainless steel.

2.4.3.2 CAR TOP: The car top shall be 14 gauge cold-rolled steel suitably reinforced. Finish shall be [matte white painted or as selected for the specific project].

2.4.3.3 HANDRAILS ON SIDES AND REAR: One and one-quarter inch round handrails [stainless steel or as selected for the specific project] shall be provided on the two sides [and at the rear of the car enclosure, single-door cars only].

2.4.3.4 WALL AND FLOOR FINISH: Furnish and install [stainless steel and laminate interiors of the style offered as standard by the car manufacturer, or as selected for the specific project. Freight cabs will usually be painted steel]. Furnish and install [sheet vinyl floors, or as selected for the specific project, on passenger and dual purpose cars][two-inch tongue-and-groove, kiln-dried oak flooring, or steel with embossed nonskid pattern, or as otherwise selected, on freight cars] [EN9]. Colors will be selected by the Owner from samples offered as standard by the car manufacturer.

2.4.3.5 PROTECTIVE PAD HOOKS AND PADS [for passenger elevators that may occasionally be used to move furniture or small quantities of construction materials]: Protective pad hooks [of stainless steel or as selected for the specific project] and fire retardant protective pads of quilted canvas duck shall be provided at all walls except the entrance walls. [If a group of two or more elevators, select one of the group for this provision].

2.4.3.6 EXHAUST FAN: A two-speed exhaust fan shall be mounted on the car top.

[Alternate]

EXHAUST FAN AND HEATER: A two-speed exhaust fan shall be mounted on the car top. A fan-forced electric heater with selectable 800-watt and 1200-watt elements shall be mounted in the front wall or side wall near the car operating panel, exact location to be approved by the Project Manager.

2.4.3.7 CAR OPERATING PANELS: A two-segment car operating panel shall be furnished inside the car. A car top operating station shall be furnished. The inside panels shall comply with all ADA standards and be configured as follows:

a. An accessible panel segment shall contain a bank of illuminated, tamper-resistant buttons marked to correspond to the landings served, an emergency call button, keyed stop switch, and door-open button. The emergency call button shall be connected to a bell that serves as an

emergency signal. Raised Braille markings, which comply with requirements for the handicapped shall be furnished for the car buttons.

b. An access-controlled panel segment shall contain light switch, utility outlet, fan switch, infrared door edge disable switch, and switch for operating mode selection. [Add any special switches such as in-car heater, access control]. Access shall be limited by a door or panel with lock keyed as specified in Paragraph 2.2.5.

2.4.3.8 TELEPHONE CABINET: A telephone cabinet shall be mounted beneath the car operating panel. Necessary wires shall be included in the car traveling cable. Telephone set and autodialer shall be a Ramtech Corp. Model R2A-S.

2.4.3.9 INTERCOM: Provide an intercom for communication between the car and the Phase 1 fire service recall landing.

2.4.3.10 INTERIOR CAR LIGHTING:

[Passenger and dual-purpose cars] Lighting shall be [indirect, with one 48-inch fluorescent lamp on each side arranged to project light efficiently onto the ceiling and protected with a satin finish stainless steel cove reflector, or as selected for the specific project].

[Freight Cars, Enclosed] Lighting fixtures shall be for fluorescent lamps and shall be recessed, with the bottom of the fixture flush with the car ceiling. Provide at least two 48-inch fluorescent lamps per car up to 40 square feet platform area. Provide one additional 48-inch lamp per 30 square feet or fraction over 40 square feet.

[Freight Cars, Open] Lighting fixtures shall be porcelain lamp holders for incandescent lamps, not fewer than two per car. Provide metal-cage guards for each lamp.

2.4.3.11 EMERGENCY CAR LIGHTING: A Nylube Products Model EL-SS emergency power unit shall be provided to illuminate the elevator car and provide current to the alarm bell in the event of power failure. If emergency power circuit is available, car lighting and alarm bell also shall be connected to the X-Panel of the building.

2.4.3.12 EXTERIOR CAR LIGHTING AND POWER: Provide a work light with switch and a duplex utility outlet on the car top. The light shall be located to illuminate the cartop operating station, the hoistway door mechanisms, the car locator mechanism, and limit switches.

2.4.3.13 ALARM BELL: Furnish and install a Nylube Model ELB-6 alarm bell.

2.4.3.14 EMERGENCY EXIT: Provide car top or side wall emergency exit in accordance with the requirements of Elevator Safety Code. Locks shall be as specified in Paragraph 2.5.5.

2.4.4 TRAVELING CABLES: A traveling cable shall be provided for electrical connections between each car and its hoistway. Each cable shall have adequate conductor capacity for all control, communication and lighting functions specified herein. In addition, provide two spare lighting/utility circuits, and four spare communications circuits in each cable. Each cable shall have flame retarding and moisture resisting outer cover. Cables shall be flexible and shall be suitably suspended to relieve strains in the individual conductors.

2.5 POWER AND CONTROL DEVICES:

2.5.1 SOLID STATE POWER SUPPLY: [Direct current traction machines only] Provide solid state power supply for [460V, 208V], 3 phase input and DC output with volt age and current capability ample to operate the elevator at the specified conditions.

[Hydraulic machines only] MOTOR STARTER: Provide a reduced-voltage motor starter for [460V, 208V], 3 phase power with voltage and current capability ample to operate the pump motor.

2.5.2 SOLID STATE POWER CONTROL:

[Traction machines only] Provide a solid state power controller to operate the hoist motor, brake, and other electromechanical devices. The controller shall include interfacing pilot electromechanical devices as required for accepting the necessary elevator hoistway switches and operating switches. These include, as a minimum, terminal slowdown devices, overtravel limit switches, solid state magnetic leveling switches, inspection operating pushbuttons, emergency stop switches and governor over-speed switch.

[Hydraulic machines only] Provide a solid state power controller to operate the control valve and other electromechanical devices. The controller shall include interfacing pilot electromechanical devices as required for accepting the necessary elevator hoistway switches and operating switches. These include, as a minimum, terminal slowdown devices, overtravel limit switches, solid state magnetic leveling switches, inspection operating pushbuttons, emergency stop switches and governor over-speed switch.

2.5.3 MICROPROCESSOR ELEVATOR LOGIC CONTROL: The operation shall be accomplished utilizing microprocessor computer logic control. The elevator control program shall be contained in nonvolatile, programmable, read only memory. Control shall be constructed such that future alterations in elevator operation may readily be made by altering the read only memory. Safety circuits shall be monitored and controlled by the programmable logic control with redundant protection. The microprocessor elevator logic control shall be contained in a NEMA 1 cabinet.

2.5.4 FAULT DIAGNOSIS: Capability shall be provided to diagnose faults to the level of individual circuit boards and individual discreet components for both the Solid State Power Controller and the Elevator Logic Controller. (Capability to diagnose faults within an individual circuit board is not required.) IF THE EQUIPMENT FOR FAULT DIAGNOSIS IS NOT COMPLETELY SELF-CONTAINED WITHIN THE CONTROLLERS BUT REQUIRES A SEPARATE, DETACHABLE DEVICE, THAT DEVICE SHALL BE FURNISHED TO THE OWNER, AT NO ADDITIONAL COST, AS A PART OF THIS SPECIFICATION.

2.5.5 FIREFIGHTERS' SERVICE: All elevator control functions, car operating devices, and hall operating devices necessary for "firefighters' service - automatic elevators" as required by the Elevator Safety Code shall be provided. The "designated level" shall be [ ], and the "alternate level" shall be [ ] [EN10]. Provide a key box for each recall station and for each elevator machine room door, the box locks to match the Seattle Fire Department standard key.

2.5.6 KEYED STOP SWITCH: An keyed stop switch shall be provided in the car, designed to cut off current supply to motor, apply brake and bring the car to rest independent of the regular operating devices.

2.5.7 TERMINAL LIMIT SWITCHES: Terminal limit switches shall be provided in the hoistway designed to automatically stop the car at terminal landings. The final hoistway limit switches shall be designed to automatically cut off the power and apply the brake, should the car travel beyond either terminal landing.

2.5.8 AUTOMATIC LEVELING DEVICE: The elevator shall be provided with a two-way automatic maintaining leveling device.

2.5.9 CAR AND HALL POSITION INDICATORS: A recessed car position indicator shall be installed. [A hall position indicator shall be installed at the main floor landing.] [EN11] The position of the car in the hoistway shall be shown by the illumination of the indication corresponding to the landing at which the car is stopped or passing.

2.5.10 HALL BUTTONS: At each terminal landing, a recessed, tamper resistant signal push button shall be provided. At each intermediate landing, a button fixture shall be provided containing recessed, tamper resistant "UP" and "DOWN" push buttons. When a call is registered by momentary pressure on a landing button, that button shall become illuminated and remain illuminated until the call is answered. An elevator use-control switch with lock keyed as specified in Paragraph 2.2.5 shall be provided in the bottom terminal hall fixture. The "ON" position shall allow any specified operating mode, and the "OFF" position shall cause the car to park at the bottom terminal landing. Raised Braille markings that comply with requirements for the handicapped shall be furnished for the car buttons.

2.5.11 CAR DIRECTION LANTERNS AND SOUND SIGNALS: Direction lanterns shall be provided in each car adjacent to (or integrated with) the car position indicator. A chime shall also be furnished on the car that will sound once for the "UP" direction and twice for the "DOWN" direction as the doors are opening.

2.5.12 HALL DIRECTION LANTERNS AND SOUND SIGNALS: Hall direction lanterns and sound signals shall be provided as follows: [EN12]

a. For groups of two or more cars, provide direction lanterns above each hoistway door. Provide a gong or chime for each hoistway door. Interconnect lanterns and gongs/chimes with the car controllers to provide advance notice of car arrival.

b. For single-car installations and two-car groups with limited traffic, provide direction lanterns recessed into car entrance door jambs. On cars with center-opening doors, direction lanterns may be located on the car rear wall, provided that they are readily visible from the landing. Provide a gong or chime, readily audible from the landing, that sounds as the doors begin to open.

2.6 ENTRANCES:

2.6.1 HOISTWAY ENTRANCES:

[Passenger and Dual Purpose Elevators] Provide new UL labeled metal doors and hoistway door frames. Doors shall be [stainless steel, cold-rolled steel]. Bottom of doors shall be provided with removable phenolic guides that run in the sill slots with minimum clearance. [EN13] Doors shall be designed to accommodate hoistway

pressurization of 0.10 inches water column while remaining fully operational. Doors shall be designed for low air leakage under pressurization. [EN14]

[Freight Elevators] Provide new UL labeled hoistway door frames and [manually] [power-] operated biparting door assemblies, complete with guides and accessories for proper operation.

a. Doors shall be designed so that upper and lower panels counterbalance each other.

b. The lower edge of the upper door section shall be provided with a fire-resistive safety astragal and narrow 1/2 round molding with nonshearing and noncrushing properties with respect to foreign objects, up to 3/4-inches thick, upon which the two door sections may close. Rubber bumpers shall be provided on the lower edge of the upper panel frame near each jamb, mounted to provide the astragal safety action specified. The rubber bumpers and safety astragal shall be designed for replacement.

c. The upper edge of the lower door section shall be equipped with a metal sill designed to be level with the landing when the doors are fully open. The sills shall be of sufficient size and strength to bridge the space between the building sill and the car platform and to support a trucking load commensurate with the load class of the elevator car. The sill shall extend the full width of the door opening.

d. If powered doors are used, the hoistway doors and car doors shall be actuated by separate door operators.

e. Doors shall be designed to accommodate hoistway pressurization of 0.10 inches water column while remaining fully operational. Doors shall be designed for low air leakage under pressurization. See Endnote 14.

2.6.2 FASCIA PLATES: Fascia plates, fabricated from #14 gauge steel, shall be fastened to the header and the sill above. Fascia plates shall have manufacturer's standard enamel finish.

2.6.3 LANDING SILLS: [Passenger Elevators] Provide extruded aluminum sills, together with all necessary supports and hardware for installation. [EN15] Install in accordance with manufacturer's recommendations. Grout sills solidly their full length after installation.

[Freight and dual purpose Elevators] Provide steel sills to match the doors selected, together with all necessary supports and hardware for installation. Install in accordance with manufacturer's recommendations. Grout sills solidly their full length after installation.

2.6.4 DOOR HANGERS AND TRACKS: Hangers and tracks shall be provided at each car and hoistway entrance. Tracks shall be of bar steel with the working surface contoured to match the sheaves. The hangers shall be designed for power operation and have provisions for vertical and lateral adjustment. Hangers shall be designed for two point suspension of the door panel. Hanger sheaves shall be polyurethane with prelubricated and sealed bearings.

2.6.5 DUST COVER: Dust covers, fabricated from #14 gauge steel, shall be furnished at each landing. Dust covers shall have manufacturer's standard enamel finish.

2.6.6 CAR DOORS:

[Passenger and Dual Purpose Elevators] The car entrance shall be provided with doors of minimum 16 gauge facing into the car [stainless steel, or as selected for the specific project], extending around the leading door edges, suitably reinforced, with integral hangers. Zone restrictors, designed to prevent car doors from being opened when the car is outside a landing zone, shall be included in all car doors.

[Freight Elevators] The car entrance shall be provided with [manually] [power] operated biparting doors compatible with the hoistway doors. Doors shall be designed so that upper and lower panels counterbalance each other for ease of operation.

2.6.7 DOOR OPERATOR: [Passenger and Dual Purpose Elevators] A door operator with direct current motor shall be provided to open and close the car and hoistway doors simultaneously. Opening speed shall not be less than 2-1/2 feet per second. Closing speed shall not exceed the limitations set by the Elevator Safety Code. Controls and interlocks that meet the requirements of the Elevator Safety Code shall be provided.

2.6.8 DOOR EDGE PROTECTIVE DEVICE: Each passenger car door shall be provided with an Adams "Infrared Curtain Unit", Janus Elevator Products "Panaforty", or equal infrared type reopening device extending the full height.

2.6.9 TOE GUARD: Toe guards, fabricated from 14-gauge steel, shall be furnished at the lowest landing of each hoistway, and on each car sill. Toe guards shall have manufacturer's standard enamel finish.

2.6.10 FINISHES: Structural members and other components for which finish is not otherwise specified shall have prime coat finish.

2.6.11 HOISTWAY ACCESS SWITCHES: Provide hoistway access switches, keyed as specified in Paragraph 2.2.5, at upper terminal landing. Provide switches also at lower terminal landing where walk-in pit is not provided.

2.7 PIT AND MACHINE ROOM:

2.7.1 EMERGENCY STOP SWITCH: In each elevator pit, provide an emergency stop switch accessible from the pit access door.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELEVATOR SYSTEMS:

3.1.1 GENERAL: Comply with manufacturer's instructions and the Elevator Safety Code for work required during installation. Comply with the requirements of Appendix F for seismic Zone 3 conditions.

3.1.2 PREINSTALLATION MEETING: Prior to installation of any elevator equipment, a meeting of Contractor and Elevator Subcontractor shall be held to review installation approach and identify any special circumstances pertaining to this installation.

3.1.3 BEAM INSTALLATION: [Traction elevators only] Install the machine beams and any sheave beams in accordance with a design approved by Project Manager and the City of Seattle.

3.1.4 JACK INSTALLATION: [Hydraulic elevators only] Install the jack in a hole excavated, cased and lined to accommodate it.

a. Casing shall be steel, not less than 1/4-inch in thickness, and with interior diameter not less than eight inches larger than the outside diameter of the wrapped jack cylinder.

b. Prior to insertion of the cylinder, the casing shall be lined with plastic in such a manner as to prevent ground contamination with leaking hydraulic fluid. If the cylinder is shipped in sections, joint areas shall be wrapped with triple fiberglass sealed with epoxy resin prior to insertion.

c. Install cylinder plumb and true with the hoistway. Following installation, backfill between the liner and the jack with clean, dry, salt-free sand in such a manner that alignment of the jack is not disturbed.

d. The Project Manager shall be given prior notice of the arrival of each jack at the job site. The Project Manager shall be given ample opportunity to inspect each jack before it is installed.

3.1.5 RAILS: Install rail brackets as needed to meet the requirements of the Elevator Safety Code, including the guidelines of Appendix F for seismic zone 3 conditions. Align rails plumb and accurately centered for elevator car position and travel.

3.1.6 DOORS: Install doors to provide smooth operation under normal conditions and to provide reliable operation under pressurized-hoistway conditions. Install hoistway doors in such a manner that air leakage is minimized under pressurized-hoistway conditions.

3.1.7 WELDED CONSTRUCTION: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance and replacement of worn parts. Comply with standards of AWS D1.1 for workmanship and for qualifications of welding operators.

3.1.8 COORDINATION: Coordinate elevator work with work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines and levels designated by Contractor, to ensure dimensional coordination of the work. Coordinate installation of hoistway entrances with installation of elevator guide rails, for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

3.1.9 SOUND ISOLATION: Mount rotating and vibrating elevator equipment and components on vibration-absorption mounts, designed to effectively prevent transmission of vibrations to structure, and thereby eliminate sources of structure-borne noise from elevator system.

3.1.10 LUBRICATION: Lubricate operating parts of systems, including ropes, if any, as recommended by manufacturers.

3.2 FIELD QUALITY CONTROL:

3.2.1 ACCEPTANCE TESTING: Upon nominal completion of each elevator installation, and before permitting use of elevator (either temporary or permanent), perform acceptance tests as required and recommended by Code and governing regulations or agencies. Advice Contractor, Project Manager, and inspection departments of governing agencies, in advance, of dates and times tests are to be performed on elevators. Advise Contractor and Project Manager, in advance, of dates and times for inspections by governing agencies. Central Plant engineers and Electricians shall be notified in advance of these tests, and shall be given ample opportunity to be present.

3.2.2 OPERATING TESTS: Load each elevator to its rated capacity and operate continuously for 30 minutes over its full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of motor during 30-minute test period. Record speed up and down and leveling relative to landing sills at the end of the period. Requirements are as follows:

a. List rise within manufacturer's tolerances.

b. Speed within 10% of specified speed.

c. Leveling within +/- 3/8-inch. Record failures of elevator to perform as required.

3.3 PROTECTION: At time of final completion of elevator work (or portion thereof), provide suitable protective coverings, barriers, devices, signs or such other methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period. Contractor is responsible for damage and wear during the construction period, and shall repair or replace, to the Owner's satisfaction, any components worn significantly or damaged before the Owner obtains beneficial use.

3.4 INSTRUCTION AND MAINTENANCE:

3.4.1 Instruct Owner's personnel in proper use, and operations and maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation. Train Owner's personnel in use of fault diagnosis and reprogramming [EN16] hardware and software.

3.5 CONDITIONS PRECEDENT TO FINAL ACCEPTANCE:

3.5.1 INSTRUCTIONS TO OPERATORS: The Contractor shall have completed instruction of the designated employees of the Owner in the operation and care of equipment and systems.

3.5.2 TESTS: All tests shall have been performed and acceptance certified by authorities having jurisdiction.

3.5.3 CODE COMPLIANCE CERTIFICATIONS: Where available from the authorities having jurisdiction, all state and local permit certificates shall be provided.

3.5.4 SUBMITTAL OF EQUIPMENT MANUALS: All manuals shall have been submitted and approved as provided in Paragraph 1.6.3.

3.5.5 SUBMITTAL OF CONSTRUCTION RECORD DRAWINGS: Construction drawings of the work shall have been marked to show changes and actual installation conditions, sufficient to form a complete record for Owner's purposes. Give particular attention to work which will be concealed and difficult to measure and record at a later date,

particularly items which may require servicing or replacement during the life of the projects, such as valves, traps, dampers, etc. Site utilities drawings shall indicate exact locations and elevations of pipe and utilities.

3.5.6 FINAL CHECK: Make a final check of each elevator operation, with Owner's personnel present and just prior to date of substantial completion to determine that control systems and operating devices are functioning properly. Any and all damage and/or significant wear shall have been repaired.

3.5.7 CLEANING: The work site shall be clean. The Contractors shall clear away all debris, surplus materials, etc., resulting from their work or operations, leaving the job and equipment furnished in a clean, first-class condition.

PART 4 - RELATED REQUIREMENTS:

Elevator-related requirements to be included on drawings and/or other Divisions of the Specifications:

DIVISION 5 - METALS

1. Machine room walls and ceilings - white glossy.

2. Machine room floors - Parker #1075 Porch & Deck paint, Maroon.

3. Pit walls from floor up five feet - white glossy.

4. Pit floors - Certified Laboratories - Seal Brite.

DIVISION 15 - MECHANICAL

1. Heating and Cooling or Ventilation to maintain machine room temperature between 40 degrees F and 85 degrees F. Requirements of some vendors may be more stringent.

2. Consider potential requirement for heating oil tank of hydraulic elevators.

3. Special sprinkler controls as required by the City of Seattle; see DCLU Rule 39-88 as revised.

DIVISION 16 - ELECTRICAL

1. Pit light.

2. Pit utility power, 110v.

3. Elevator lobby and machine room smoke detectors, installed complete for initiating firefighter's service phase.

4. Elevator power, 208 or 480 volt, 3 phase, to a fused/breakered disconnect in machine room. If machine room and/or hoistway top are sprinklered, a shunt-trip breaker is required; see DCLU Rule 39-88 as revised.

5. Elevator car lighting and utility power, 120 volt, 1 phase, to a fused/breakered disconnect in machine room. If emergency power is available, include this function.

ENDNOTES

1. *At the end of this section is a list of elevator-related requirements to be included elsewhere in the Construction Documents.*

2. *Usual practice is for the elevator contractor to provide the machine and sheave beams, the rails, and the connections of these to the structure. The elevator contractor is required to provide data on the loads imposed by these elements on the structures to which they are fastened. He is also required to provide data on the loads imposed on the pit floor by rails (braking action), buffers, and hydraulic jacks.*

3. *In specifying the load limits of freight or dual-purpose elevators, consideration should be given to the potential for misuse. For example, if paper or other dense material is to be moved from floor to floor, the potential for overload should be considered. If a fork-lift truck or other heavy-lift vehicles are to be used or readily available around the elevator, Class C machines should be considered.*

4. *This is defined as the start of door movement to close until 90% open. Standards are about 6 seconds for traction machines, more for hydraulic. This item is important only in buildings with heavy dependence on elevators.*

5. *Add any emergency power requirements for one or more cars.*

6. *If programming indicates a need for special inside care dimensions (e.g., for a particular size of supply cart), put the requirements here. This will apply to inside height as well as clear floor dimensions.*

7. *For heavily used elevators, single-speed center opening doors are preferred. In all installations, no more than two panels per opening are preferred.*

8. *Alternate sections are presented for conventional traction and direct-action hydraulic machines. For less-common alternatives, such as roped hydraulic, one or both alternatives may be modified.*

9. *Ceramic tile or other brittle, non-resilient materials are not to be used.*

10. *Levels to be determined during design and included herein.*

11. *Hall position indicators are not warranted on low-rise machines, and should be limited to one at the main floor in high-rise buildings. Additional position indicators must have specific justification and approval.*

12. *For heavily used car groups, the intent is to provide direction lantern and sound systems that work with group dispatch controller for best service. This feature is rarely warranted on one-car installations, and may be of marginal value on some two-car groups.*

13. *Programming requirements may dictate stronger doors, particularly on passenger machines with frequent freight use.*

14. *The fire service requirement to be operational has two aspects: 1) minimizing the fan size to pressurize the hoistway by minimizing leakage, and 2) hanging and powering the door in such a way that it will operate relatively freely under pressurized conditions.*

15. *Nickel silver, bronze, steel, or other material may be used if justified for specific installations.*

16. *As used herein, "reprogramming" refers to changes in operating parameters such as speed, acceleration, jerk, pre-opening, door speed, and door dwell.*

17.

End of Appendix 2 - A